TOPIC: 292008
KNOWLEDGE: K1.01 [3.8/3.9]
QID: B3365

A nuclear power plant was operating at steady-state 100% power near the end of a fuel cycle when a reactor scram occurred. Reactor pressure is being maintained at 600 psig in anticipation of commencing a reactor startup.

Four hours after the scram, with reactor pressure still at 600 psig, which one of the following will cause the fission rate in the reactor core to increase?

A. Reactor vessel pressure is allowed to increase by 20 psig.

B. Reactor coolant temperature is allowed to increase by 3°F.

C. The operator fully withdraws the first group of control rods.

D. An additional two hours is allowed to pass with no other changes in plant parameters.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.01 [3.8/3.9]
QID: B3465 (P3464)

A nuclear power plant was operating at steady-state 100% power near the end of a fuel cycle when a reactor scram occurred. Four hours after the scram, reactor pressure is being maintained at 600 psig in anticipation of commencing a reactor startup.

At this time, which one of the following will cause the fission rate in the reactor core to decrease?

A. Core void fraction is decreased by 2%.

B. Reactor coolant temperature is allowed to decrease by 3°F.

C. The operator fully withdraws the first group of control rods.

D. An additional two hours is allowed to pass with no other changes in plant parameters.

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.02 [3.8/3.8]
QID: B1065 (N/A)

A refueling outage has just been completed and a reactor startup is being commenced. Which one of the following lists the method(s) used to add positive reactivity during the startup to criticality?

A. Control rods only

B. Recirculation pump flow only

C. Control rods and recirculation pump flow

D. Recirculation pump flow and steaming rate

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.03 [4.1/4.0]
QID: B266 (P65)

While withdrawing control rods during a reactor startup, the count rate doubles. If the <u>same</u> amount of reactivity that caused the first doubling is added again, the count rate will __________ and the reactor will be ____________.

A. more than double; subcritical

B. more than double; critical

C. double; subcritical

D. double; critical

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.03 [4.1/4.0]
QID: B1565 (P1065)

During a reactor startup, equal increments of positive reactivity are being sequentially added and the count rate is allowed to reach equilibrium after each addition. Which one of the following statements concerning the equilibrium count rate applies after each successive reactivity addition?

A. The time required to reach equilibrium count rate is the same.

B. The time required to reach equilibrium count rate is shorter.

C. The numerical change in equilibrium count rate increases.

D. The numerical change in equilibrium count rate is the same.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.03 [4.1/4.0]
QID: B1766 (P2468)

A reactor startup is in progress with a current K_{eff} of 0.95 and a current equilibrium source range count rate of 150 cps. Which one of the following equilibrium count rates will occur when K_{eff} becomes 0.98?

A. 210 cps

B. 245 cps

C. 300 cps

D. 375 cps

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.03 [4.1/4.0]
QID: B1964

A reactor startup is in progress and the reactor is slightly subcritical. Assuming the reactor remains subcritical, a short control rod withdrawal will cause the reactor period to initially shorten, and then...

A. gradually lengthen and stabilize at a negative 80 second period.

B. gradually lengthen and stabilize at infinity.

C. gradually lengthen until reactor power reaches the point of adding heat, then stabilize at infinity.

D. gradually lengthen until the neutron population reaches equilibrium, then stabilize at a negative 80 second period.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.03 [4.1/4.0]
QID: B2069

A reactor startup is in progress with a current K_{eff} of 0.95 and a current equilibrium source range count rate of 120 cps. Which one of the following equilibrium count rates will occur when K_{eff} becomes 0.98?

A. 210 cps

B. 245 cps

C. 300 cps

D. 375 cps

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.03 [4.1/4.0]
QID: B2165 (P1766)

A reactor startup is in progress with the reactor currently subcritical.

Which one of the following describes the change in count rate resulting from a short control rod withdrawal with K_{eff} at 0.95 as compared to an identical control rod withdrawal with K_{eff} at 0.99? (Assume reactivity additions are equal, and the reactor remains subcritical.)

A. Both the prompt jump in count rate and the increase in stable count rate will be the same.

B. Both the prompt jump in count rate and the increase in stable count rate will be smaller with K_{eff} at 0.95.

C. The prompt jump in count rate will be smaller with K_{eff} at 0.95, but the increase in stable count rate will be the same.

D. The prompt jump in count rate will be the same, but the increase in stable count rate will be smaller with K_{eff} at 0.95.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.03 [4.1/4.0]
QID: B2365 (P2366)

A reactor startup is in progress with a current K_{eff} of 0.95 and a current stable source range count rate of 120 cps. Which one of the following equilibrium count rates will occur when K_{eff} becomes 0.97?

A. 200 cps

B. 245 cps

C. 300 cps

D. 375 cps

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.03 [4.1/4.0]
QID: B2465 (P2466)

A reactor startup is being performed by adding equal amounts of positive reactivity and waiting for neutron population to stabilize. As the reactor approaches criticality, the numerical change in stable neutron population after each reactivity addition __________, and the time required for the neutron population to stabilize after each reactivity addition ___________.

A. increases; remains the same

B. increases; increases

C. remains the same; remains the same

D. remains the same; increases

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.03 [4.1/4.0]
QID: B2566

A reactor startup is in progress with a current K_{eff} of 0.95 and a current equilibrium source range count rate of 120 cps. Which one of the following equilibrium count rates will occur when K_{eff} becomes 0.985?

A. 250 cps

B. 300 cps

C. 350 cps

D. 400 cps

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B67

As a reactor approaches criticality during a reactor startup it takes longer to reach an equilibrium neutron count rate after each control rod withdrawal due to the increased...

A. fraction of fission neutrons leaking from the core.

B. number of neutron generations required to reach a stable level.

C. length of time from neutron generation to absorption.

D. fraction of delayed neutrons appearing as criticality is approached.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B365 (P365)

A reactor startup is in progress with a stable source range count rate and the reactor is near criticality. Which one of the following statements describes count rate characteristics during and after a 5-second control rod withdrawal? (Assume the reactor remains subcritical.)

A. There will be no change in count rate until criticality is achieved.

B. The count rate will rapidly increase (prompt jump) to a stable higher value.

C. The count rate will rapidly increase (prompt jump) then gradually increase and stabilize at a higher value.

D. The count rate will rapidly increase (prompt jump) then gradually decrease and stabilize at the previous value.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B366 (P2265)

During a reactor startup, source range monitors (SRMs) indicate a stable count rate of 100 cps, and K_{eff} is 0.95. After a number of control rods have been withdrawn, SRM indication stabilizes at 270 cps. Which one of the following is the new K_{eff}? (Assume reactor period is infinity before and after the rod withdrawal.)

A. 0.963

B. 0.972

C. 0.981

D. 0.990

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B865

During reactor startup, critical rod position is affected by...

A. core flow rate.

B. source range initial count rate.

C. recirculation ratio.

D. core age.

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B966

During an initial reactor fuel load, the 1/M factor decreases from 1.0 to 0.5 after the first 100 fuel assemblies are loaded. What is the current value of K_{eff}?

A. 0.2

B. 0.5

C. 0.875

D. 1.0

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B1067 (P1972)

At one point during a reactor startup and approach to criticality, count rate is noted to be 780 cps, and K_{eff} is calculated to be 0.92. Later in the same startup, count rate is 4160 cps.

What is the new K_{eff}?

A. 0.945

B. 0.950

C. 0.975

D. 0.985

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B1566 (P266)

During a reactor startup, the operator adds 1.0% ΔK/K of positive reactivity by withdrawing control rods, thereby increasing equilibrium source range neutron level from 220 cps to 440 cps.

Approximately how much additional positive reactivity is required to raise the equilibrium source range neutron level to 880 cps?

A. 4.0% ΔK/K

B. 2.0% ΔK/K

C. 1.0% ΔK/K

D. 0.5% ΔK/K

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B1665 (P1770)

Refer to the drawing of three 1/M plots labeled A, B, and C (see figure below).

The least conservative approach to criticality is represented by plot _____ and could possibly be the result of recording count rates at ________ time intervals after incremental fuel loading steps compared to the situations represented by the other plots.

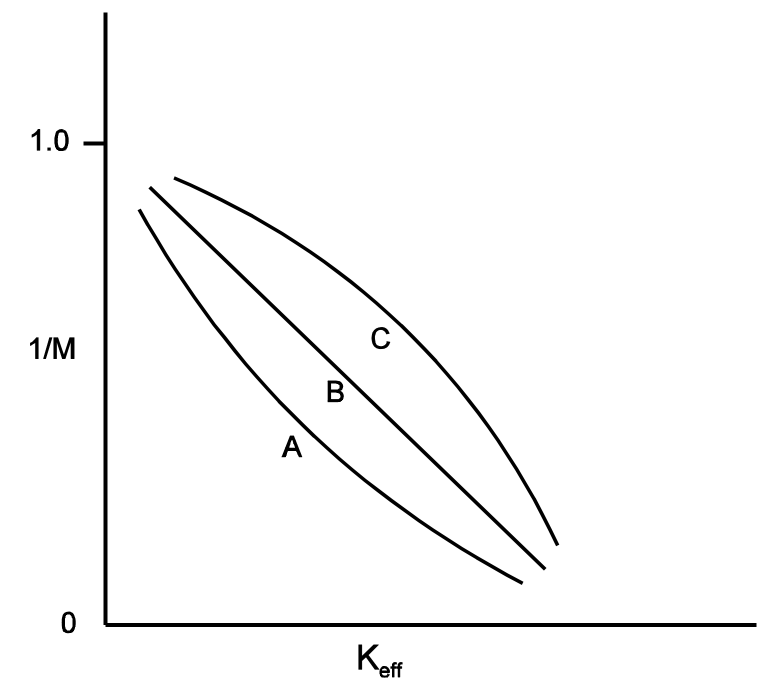
A. A; shorter

B. A; longer

C. C; shorter

D. C; longer

ANSWER: C.



1/M PLOT

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B1967 (P1265)

During an initial fuel load, the subcritical multiplication factor increases from 1.0 to 4.0 as the first 100 fuel assemblies are loaded. What is the corresponding final k_{eff}?

A. 0.25

B. 0.5

C. 0.75

D. 1.0

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B2167 (P1867)

During a reactor startup, the first reactivity addition caused the count rate to increase from 20 to 40 cps. The second reactivity addition caused the count rate to increase from 40 to 80 cps. Assume k_{eff} was 0.92 prior to the first reactivity addition.

Which one of the following statements describes the magnitude of the reactivity additions?

A. The first reactivity addition was approximately twice as large as the second.

B. The second reactivity addition was approximately twice as large as the first.

C. The first and second reactivity additions were approximately the same.

D. There is not enough data given to determine the relationship between reactivity values.

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B2266

As a reactor approaches criticality during a reactor startup it takes longer to reach an equilibrium neutron count rate after each control rod withdrawal due to the increased...

A. length of time required to complete a neutron generation.

B. number of neutron generations required to reach a stable neutron level.

C. length of time from neutron birth to absorption.

D. fraction of delayed neutrons being produced as criticality is approached.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B2765 (P2766)

During a reactor startup, source range indication is stable at 120 cps with K_{eff} at 0.95. After a period of control rod withdrawal, source range indication stabilizes at 600 cps.

Which one of the following is the approximate new K_{eff}?

A. 0.96

B. 0.97

C. 0.98

D. 0.99

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B2966 (P2968)

A reactor startup is in progress; control rod withdrawal has just been stopped to assess criticality. Which one of the following is a combination of indications in which <u>each</u> listed indication supports a declaration that the reactor is critical?

A. Period stabilizes at +200 sec; source range count rate is slowly increasing; inverse multiplication (1/M) value equals 0.000.

B. Period is approaching infinity; source range count rate increases and then stabilizes; inverse multiplication (1/M) value equals 0.111.

C. Period stabilizes at +200 sec; source range count rate is slowly increasing; inverse multiplication (1/M) value equals 1.000.

D. Period is approaching infinity; source range count rate increases and then stabilizes; inverse multiplication (1/M) value equals 1.111.

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.04 [3.3/3.4]
QID: B3665 (P3665)

Refer to the drawing of a 1/M plot with curves A and B (see figure below). Assume that each axis has linear units.

Curve A would result if each fuel assembly loaded during the early stages of the refueling caused a relatively ______ fractional change in source range count rate compared to the later stages of the refueling; curve B would result if each fuel assembly contained equal ________.

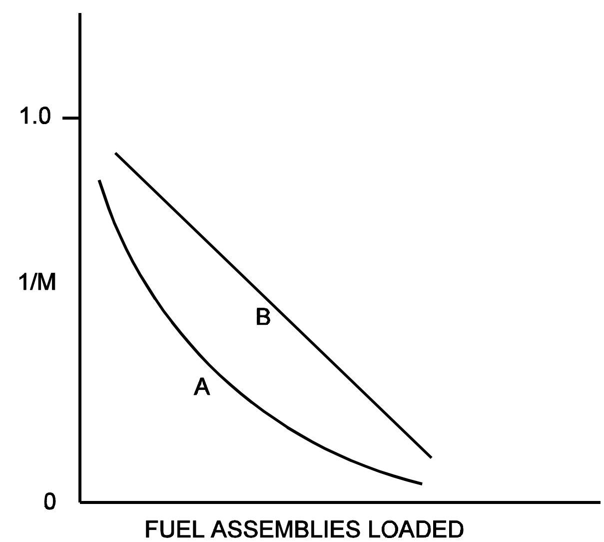
A. small; fuel enrichment

B. small; reactivity

C. large; fuel enrichment

D. large; reactivity

ANSWER: D.



1/M PLOT

TOPIC: 292008
KNOWLEDGE: K1.05 [4.3/4.3]
QID: B267

A reactor startup is in progress with K_{eff} at 0.995 and stable source range indication. If K_{eff} is increased to 0.997 by control rod withdrawal, reactor period will initially become ____________ and then ____________.

A. positive; approach infinity

B. positive; stabilize at a positive value

C. negative; approach infinity

D. negative; stabilize at a negative value

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.05 [4.3/4.3]
QID: B1365 (P267)

As criticality is approached during a reactor startup, equal insertions of positive reactivity result in a ____________ change in equilibrium count rate and a ____________ time to reach each new equilibrium.

A. larger; longer

B. larger; shorter

C. smaller; longer

D. smaller; shorter

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.05 [4.3/4.3]
QID: B3566 (P3567)

A reactor startup is in progress for a reactor that is in the middle of a fuel cycle. The reactor is at normal operating temperature and pressure. The main steam isolation valves are open and the main turbine bypass (also called steam dump) valves are closed. The reactor is near criticality.

Reactor period is stable at infinity when, suddenly, a turbine bypass valve fails open and remains stuck open, dumping steam to the main condenser. The operator immediately ensures <u>no</u> control motion is occurring and takes <u>no</u> further action. Assume that the reactor vessel water level remains stable, the reactor does <u>not</u> scram, and <u>no</u> other protective actions occur.

As a result of the valve failure, reactor period will initially become __________; and reactor power will stabilize __________ the point of adding heat.

A. positive; at

B. positive; above

C. negative, but soon turn; at

D. negative, but soon turn; above

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.06 [4.2/4.2]
QID: B1267

A reactor is exactly critical during a reactor startup. Which one of the following must be closely monitored and controlled to ensure safe operation of the reactor as power is raised to the point of adding heat?

A. Reactor period

B. Reactor temperature

C. Source range count rate

D. Power peaking factors

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.06 [4.2/4.2]
QID: B1567 (P1667)

The following data was obtained at steady-state conditions during a reactor startup:

ROD POSITION (UNITS WITHDRAWN)	COUNT RATE (CPS)
0	180
5	200
10	225
15	257
20	300
25	360
30	450

Assuming uniform differential rod worth, at what approximate rod position should criticality occur?

A. Approximately 40 units withdrawn

B. Approximately 50 units withdrawn

C. Approximately 60 units withdrawn

D. Approximately 70 units withdrawn

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.06 [4.2/4.2]
QID: B1767 (P1966)

The following data was obtained at steady-state conditions during a reactor startup:

ROD POSITION (UNITS WITHDRAWN)	COUNT RATE (CPS)
10	360
15	400
20	450
25	514
30	600
35	720
40	900

Assuming uniform differential rod worth, at what approximate rod position will criticality occur?

A. 50 units withdrawn

B. 60 units withdrawn

C. 70 units withdrawn

D. 80 units withdrawn

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.06 [4.2/4.2]
QID: B1866

A reactor has just achieved criticality during a xenon-free reactor startup. Instead of stabilizing power at 10^3 cps per the startup procedure, the operator inadvertently allows reactor power to increase to 10^4 cps as indicated on the source range monitors.

Assuming reactor vessel coolant temperature and pressure do not change, the critical rod height at 10^4 cps will be ______________ the critical rod height at 10^3 cps. (Neglect any effects of changes in fission product poisons.)

A. different but unpredictable compared to

B. less than

C. greater than

D. equal to

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.06 [4.2/4.2]
QID: B2767 (P1167)

The following data was obtained during a reactor startup:

ROD POSITION (UNITS WITHDRAWN)	COUNT RATE (CPS)
0	180
10	210
15	250
20	300
25	360
30	420

Assuming uniform differential rod worth, at what approximate rod height will criticality occur?

A. 35 to 45 units withdrawn

B. 46 to 55 units withdrawn

C. 56 to 65 units withdrawn

D. 66 to 75 units withdrawn

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.06 [4.2/4.2]
QID: B2867 (P1167)

The following data was obtained during a reactor startup:

ROD POSITION (UNITS WITHDRAWN)	COUNT RATE (CPS)
0	180
10	210
15	250
20	300
25	360
30	420

Assuming uniform differential rod worth, at what approximate rod height will criticality occur?

A. 31 to 45 units withdrawn

B. 46 to 60 units withdrawn

C. 61 to 75 units withdrawn

D. 76 to 90 units withdrawn

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.07 [3.9/3.9]
QID: B123 (P68)

With $K_{eff} = 0.985$, how much reactivity must be added to make a reactor exactly critical?

A. 1.54% ΔK/K

B. 1.52% ΔK/K

C. 1.50% ΔK/K

D. 1.48% ΔK/K

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.07 [3.9/3.9]
QID: B667

When a reactor is exactly critical, reactivity is...

A. greater than 1.0% $\Delta K/K$.

B. equal to 1.0% $\Delta K/K$.

C less than 1.0% $\Delta K/K$.

D. undefined.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.07 [3.9/3.9]
QID: B867 (P2267)

When a reactor is exactly critical, reactivity is...

A. infinity.

B. undefined.

C. 0.0 $\Delta K/K$.

D. 1.0 $\Delta K/K$.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.08 [4.1/4.1]
QID: B269 (P69)

During a reactor startup, a stable positive 30 second reactor period is achieved with no further reactivity addition. The reactor is...

A. exactly critical.

B. supercritical.

C. subcritical.

D. prompt critical.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.08 [4.1/4.1]
QID: B868 (P868)

Which one of the following indicates that a reactor has achieved criticality during a normal reactor startup?

A. Constant positive period with no rod motion

B. Increasing positive period with no rod motion

C. Constant positive period during rod withdrawal

D. Increasing positive period during rod withdrawal

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.08 [4.1/4.1]
QID: B1069

A reactor is critical just below the point of adding heat (POAH) at a temperature of 160°F. Which one of the following will result in reactor power increasing and stabilizing at the POAH? (Assume a negative moderator temperature coefficient.)

A. Reactor recirculation flow increases 10%.

B. Reactor coolant temperature increases 3°F.

C. A single control rod moves in one notch.

D. Core xenon-135 concentration decreases.

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.08 [4.1/4.1]
QID: B2668 (P2667)

A nuclear reactor is critical at 10^{-6}% power. Control rods are withdrawn for 5 seconds and then stopped, resulting in a stable reactor period of positive 100 seconds.

If control rods had been inserted (instead of withdrawn) for 5 seconds with the reactor initially critical at 10^{-6}% power, the stable reactor period would have been: (Assume equal absolute values of reactivity are added in both cases.)

A. longer than negative 100 seconds because, compared to power increases, reactor power decreases are more limited by delayed neutrons.

B. shorter than negative 100 seconds because, compared to power increases, reactor power decreases are less limited by delayed neutrons.

C. longer than negative 100 seconds because, compared to power increases, reactor power decreases result in smaller delayed neutron fractions.

D. shorter than negative 100 seconds because, compared to power increases, reactor power decreases result in larger delayed neutron fractions.

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.10 [3.6/3.6]
QID: B468

A reactor is being started up from cold shutdown conditions with a stable positive 100-second period and power is entering the intermediate range. Assuming no operator action is taken that affects reactivity, which one of the following will occur?

A. Reactor period remains constant until saturation conditions are reached.

B. Reactor period increases to infinity as heat production in the reactor exceeds ambient losses.

C. Reactor period remains constant until void production begins in the core.

D. Reactor period decreases to zero as the fuel temperature increase adds negative reactivity to the core.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.10 [3.6/3.6]
QID: B669

A reactor is being started up with a stable positive 100-second period and power is entering the intermediate range (below the point of adding heat). Assuming no operator action, which one of the following describes the response of reactor period?

A. Prior to reaching the point of adding heat, the fuel temperature increase will add negative reactivity and reactor period will approach infinity.

B. As heat production in the reactor exceeds ambient losses, the temperature of the fuel and moderator will increase, adding negative reactivity, and reactor period will approach infinity.

C. The heat produced by the reactor through all ranges of the intermediate range indication, is insufficient to raise the fuel or moderator temperatures, and reactor period remains constant throughout the intermediate range.

D. As heat production in the reactor exceeds ambient losses, positive reactivity added by the fuel temperature increase counteracts the negative reactivity added by the moderator temperature increase, and reactor period remains constant throughout the intermediate range.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.10 [3.6/3.6]
QID: B2168 (P1870)

A reactor startup is in progress following a one-month shutdown. Upon reaching criticality, the operator establishes a positive 80-second period and stops rod motion.

After an additional 30 seconds, reactor power will be ________ and reactor period will be ________. (Assume reactor power remains below the point of adding heat.)

A. increasing; increasing

B. increasing; constant

C. constant; increasing

D. constant; constant

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.10 [3.6/3.6]
QID: B2671 (P2668)

A reactor is being started up under cold shutdown conditions with a stable positive 100-second period and power is entering the intermediate range. Assuming no operator action is taken that affects reactivity, reactor period will remain constant until...

A. void production begins in the core, then reactor period will increase toward infinity.

B. core heat production exceeds ambient losses, then reactor period will increase toward infinity.

C. xenon-135 production becomes significant, then reactor period will decrease toward zero.

D. fuel temperature begins to increase, then reactor period will decrease toward zero.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.11 [3.7/3.8]
QID: B568

After recording critical data during a cold reactor startup with main steam isolation valves open, the operator withdraws the control rods to continue the startup. Which one of the following pairs of parameters will provide the first indication of reaching the point of adding heat?

A. Reactor pressure and reactor water level

B. Reactor power and reactor period

C. Reactor pressure and turbine load

D. Reactor water level and core flow rate

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.11 [3.7/3.8]
QID: B3934 (P3935)

After taking critical data during a reactor startup, the operator establishes a stable 50-second reactor period to increase power to the point of adding heat (POAH). Which one of the following is the approximate amount of reactivity that must be added to stabilize reactor power at the POAH? (Assume $\overline{\beta}_{eff} = 0.006$.)

A. -0.01 %ΔK/K

B. -0.06 %ΔK/K

C. -0.10 %ΔK/K

D. -0.60 %ΔK/K

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.12 [3.6/3.7]
QID: B133 (P1169)

A reactor is critical well below the point of adding heat when a small amount of <u>positive</u> reactivity is added to the core. If the same amount of <u>negative</u> reactivity is added to the core approximately 1 minute later, reactor power will stabilize at...

A. the initial power level.

B. somewhat higher than the initial power level.

C. somewhat lower than the initial power level.

D. the subcritical multiplication equilibrium level.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.12 [3.6/3.7]
QID: B2467

Criticality has just been achieved during a reactor startup at 160°F. The operator withdraws control rods as necessary to establish a stable positive 30-second reactor period. No additional operator actions are taken.

How will reactor period and reactor power respond? (Assume a negative moderator temperature coefficient.)

A. Reactor power will increase and stabilize at the POAH; reactor period will remain constant until the POAH is reached and then stabilize at infinity.

B. Reactor power will increase and stabilize at the POAH; reactor period will decrease slowly until the POAH is reached and then stabilize at infinity.

C. Reactor power will increase and stabilize above the POAH; reactor period will remain constant until the POAH is reached and then stabilize at infinity.

D. Reactor power will increase and stabilize above the POAH; reactor period will decrease slowly until the POAH is reached and then stabilize at infinity.

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.12 [3.6/3.7]
QID: B1467 (P2269)

A reactor is critical at the point of adding heat when a small amount of <u>negative</u> reactivity is added to the core. If the same amount of <u>positive</u> reactivity is added to the core approximately 5 minutes later, reactor power will...

A. stabilize at the subcritical multiplication equilibrium neutron level.

B. stabilize at a level lower than the initial power level.

C. continue to decrease on a negative 80 second period.

D. stabilize at the initial power level.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.12 [3.6/3.7]
QID: B2268 (P571)

A reactor startup is in progress and criticality has just been achieved. After recording critical rod height, the operator withdraws control rods for 20 seconds to establish a positive 30-second reactor period. One minute later (prior to the point of adding heat) the operator inserts the same control rods for 25 seconds. (Assume the control rod withdrawal and insertion rates are the same.)

During the rod insertion, the reactor period will become...

A. negative during the entire period of control rod insertion.

B. negative shortly after the control rods pass through the critical rod height.

C. negative just as the control rods pass through the critical rod height.

D. negative shortly before the control rods pass through the critical rod height.

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.12 [3.6/3.7]
QID: B2568 (P2568)

A reactor is currently at 10^{-3}% power with a positive 60 second reactor period. An amount of negative reactivity is added to the core that places the reactor on a negative 40 second reactor period.

If the same amount of positive reactivity is added to the core approximately 5 minutes later, reactor power will...

A. increase and stabilize at the point of adding heat.

B. increase and stabilize at 10^{-3}% power.

C. continue to decrease on a negative 40 second period until the equilibrium source neutron level is reached.

D. continue to decrease with an unknown period until the equilibrium source neutron level is reached.

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.12 [3.6/3.7]
QID: B2969 (P2970)

A reactor startup is in progress and criticality has just been achieved. After recording the critical rod heights, the operator withdraws a control rod for 20 seconds to establish a stable positive 30-second reactor period. One minute later (prior to reaching the point of adding heat), the operator inserts the same control rod for 25 seconds.

During the insertion, when will the reactor period become negative?

A. Immediately when the control rod insertion is initiated.

B. After the control rod passes through the critical rod height.

C. Just as the control rod passes through the critical rod height.

D. Prior to the control rod passing through the critical rod height.

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.12 [3.6/3.7]
QID: B3668 (P3668)

A reactor is slightly supercritical during a reactor startup. A short control rod withdrawal is performed to establish the desired reactor period. Assume that the reactor remains slightly supercritical after the control rod withdrawal, and that reactor power remains well below the point of adding heat.

Immediately after the control rod withdrawal is stopped, the reactor period will initially lengthen and then...

A. stabilize at a positive value.

B. turn and slowly shorten.

C. stabilize at infinity.

D. continue to slowly lengthen.

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.12 [3.6/3.7]
QID: B4034

A nuclear reactor is initially critical in the source range. Then a constant rate addition of positive reactivity commences and lasts for 120 seconds. Assume reactor power remains below the point of adding heat for the entire 120 second time interval.

During the 120 second time interval, reactor period will initially shorten and then _____; and reactor power will initially increase and then _______.

A. continue to shorten at a decreasing rate; continue to increase at an increasing rate

B. continue to shorten at a decreasing rate; continue to increase at a decreasing rate

C. continue to shorten at a increasing rate; continue to increase at an increasing rate

D. continue to shorten at an increasing rate; continue to increase at a decreasing rate

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.13 [3.8/3.9]
QID: B271

Upon reaching criticality during a reactor startup, the operator establishes a positive reactor period. Upon reaching the point of adding heat, the period will become ____________ due to the ______________ reactivity feedback of moderator and fuel temperature.

A. shorter; negative

B. shorter; positive

C. longer; negative

D. longer; positive

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.13
QID: B670 (P670)

After taking critical data during a reactor startup, the operator establishes a 26-second reactor period to increase power to the point of adding heat (POAH). How much negative reactivity feedback must be added at the POAH to stop the power increase?

Assume:

β = 0.00579
l^* = 1×10^{-5} seconds
λ_{eff} = 0.1 seconds^{-1}

A. 0.16% ΔK/K

B. 0.19% ΔK/K

C. 0.23% ΔK/K

D. 0.29% ΔK/K

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.13 [3.8/3.9]
QID: B968

After taking critical data during a reactor startup, the operator establishes a positive 26-second reactor period to increase power to the point of adding heat (POAH). How much negative reactivity must be added to stabilize power at the POAH? (Assume $\overline{\beta}_{eff} = 0.00579$.)

A. 0.10% ΔK/K

B. 0.16% ΔK/K

C. 1.0% ΔK/K

D. 1.6% ΔK/K

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.13 [3.8/3.9]
QID: B1667

After taking critical data during a reactor startup, the operator establishes a stable 38-second reactor period to increase power to the point of adding heat (POAH). Which one of the following is the approximate negative reactivity required to stop the power increase at the POAH? (Assume that $\beta = 0.00579$.)

A. 0.01% ΔK/K

B. 0.12% ΔK/K

C. 0.16% ΔK/K

D. 0.21% ΔK/K

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.13 [3.8/3.9]
QID: B1769

After taking critical data during a reactor startup, the operator establishes a positive 31-second reactor period to increase power to the point of adding heat (POAH). Which one of the following is the appropriate amount of reactivity needed to stabilize power at the POAH? (Assume $\overline{\beta}_{eff} = 0.00579$.)

A. -0.14% $\Delta K/K$

B. -0.16% $\Delta K/K$

C. -1.4% $\Delta K/K$

D. -1.6% $\Delta K/K$

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.13 [3.8/3.9]
QID: B2369 (P2370)

After taking critical data during a reactor startup, the operator establishes a positive 48-second reactor period to increase power to the point of adding heat (POAH). Which one of the following is the approximate amount of reactivity needed to stabilize power at the POAH? (Assume $\overline{\beta}_{eff} = 0.00579$.)

A. -0.10% ΔK/K

B. -0.12% ΔK/K

C. -0.01% ΔK/K

D. -0.012% ΔK/K

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.13 [3.8/3.9]
QID: B3068 (P3068)

After taking critical data during a reactor startup, the operator establishes a stable 34-second reactor period to increase power to the point of adding heat (POAH). Which one of the following is the approximate amount of reactivity that must be added to stabilize reactor power at the POAH? (Assume $\overline{\beta}_{eff} = 0.0066$.)

A. -0.10 %ΔK/K

B. -0.12 %ΔK/K

C. -0.15 %ΔK/K

D. -0.28 %ΔK/K

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.13 [3.4/3.6]
QID: B3934 (P3935)

After taking critical data during a reactor startup, the operator establishes a stable 0.52 dpm startup rate to increase power to the point of adding heat (POAH). Which one of the following is the approximate amount of reactivity that must be added to stabilize reactor power at the POAH? (Assume $\overline{\beta}_{eff} = 0.006$.)

A. -0.01 %ΔK/K

B. -0.06 %ΔK/K

C. -0.10 %ΔK/K

D. -0.60 %ΔK/K

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.14 [3.5/3.5]
QID: B769

During a reactor heat-up, a center control rod is notched outward with no subsequent operator action. The heat-up rate will...

A. increase initially, then gradually decrease.

B. decrease initially, then gradually increase.

C. increase and stabilize at a new higher value.

D. decrease and stabilize at a new lower value.

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.14 [3.5/3.5]
QID: B1071

A reactor heat-up from 180°F to 500°F is in progress. To maintain a constant heat-up rate, as reactor temperature increases reactor power will have to...

A. increase due to increasing density of water.

B. decrease due to decreasing specific heat of water.

C. increase due to increasing heat losses to ambient.

D. decrease due to decreasing heat of vaporization of water.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.14 [3.5/3.5]
QID: B1468

A nuclear reactor is undergoing a startup with reactor pressure and temperature initially stable at 731.4 psia and 508°F. Main steam isolation valves are closed and reactor criticality has been achieved. The reactor currently has a stable positive 100-second reactor period with reactor power well below the point of adding heat (POAH).

Which one of the following will occur first when reactor power reaches the POAH?

A. Reactor period will shorten.

B. Reactor pressure will increase.

C. Reactor coolant temperature will decrease.

D. Intermediate range power level will decrease.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.15 [3.7/3.7]
QID: B469

A reactor is stable at the point of adding heat (POAH) with the reactor coolant at 160°F during the reactor heat-up and pressurization phase of a reactor startup. Control rods are withdrawn a few notches to raise reactor power and establish a heat-up rate. Assume no core voiding occurs.

If no further control rod withdrawal occurs, reactor power will...

A. remain stable until voiding begins to occur.

B. increase until the control rods are reinserted.

C. decrease and stabilize at a subcritical power level.

D. decrease and stabilize at the POAH.

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.15 [3.7/3.7]
QID: B1966 (P1367)

A reactor is critical at 5 x 10^{-2}% power during a cold reactor startup at the beginning of core life. Reactor period is stable at positive 87 seconds. Assuming no operator action, no reactor scram, and no steam release, what will be reactor power 10 minutes later?

A. Below the point of adding heat (POAH)

B. At the POAH

C. Above the POAH but less than 49%

D. Approximately 50%

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.15 [3.7/3.7]
QID: B2569

A reactor is critical at 10^{-3}% power during a cold reactor startup at the beginning of core life. Reactor period is stable at positive 60 seconds. Assuming no operator action, no reactor scram, and no steam release, what will be reactor power 10 minutes later?

A. Below the point of adding heat (POAH)

B. At the POAH

C. Approximately 22%

D. Greater than 100%

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.16 [3.6/3.7]
QID: B870

During a reactor plant startup, reactor pressure is increased from 5 psig to 50 psig in a 2-hour period. What was the average heat-up rate?

A. 35°F/hr

B. 60°F/hr

C. 70°F/hr

D. 120°F/hr

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.16 [3.6/3.7]
QID: B1972

A reactor is critical and a reactor coolant heat-up is in progress with coolant temperature currently at 140°F. If the point of adding heat is 1% reactor power, and reactor power is held constant at 3% during the heat-up, which one of the following describes the coolant heat-up rate (HUR) from 140°F to 200°F?

A. HUR will initially decrease and then increase.

B. HUR will slowly decrease during the entire period.

C. HUR will slowly increase during the entire period.

D. HUR will remain the same during the entire period.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.18 [3.8/3.8]
QID: B1270

Which one of the following will add the <u>most</u> <u>positive</u> reactivity during a power decrease from 100% to 65% over a 1 hour period? (Assume the power change is performed only by changing core recirculation flow rate.)

A. Fuel temperature change

B. Moderator temperature change

C. Fission product poison change

D. Core void fraction change

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.18 [3.8/3.8]
QID: B1371 (P1470)

With a reactor on a constant period, which one of the following power changes requires the <u>longest</u> time to occur?

A. 1% power to 4% power

B. 5% power to 15% power

C. 20% power to 35% power

D. 40% power to 60% power

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.18 [3.8/3.8]
QID: B1570 (P1567)

With a reactor on a constant period of 30 seconds, which one of the following power changes requires the <u>least</u> time to occur?

A. 1% power to 6% power

B. 10% power to 20% power

C. 20% power to 35% power

D. 40% power to 60% power

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.18 [3.8/3.8]
QID: B1765

Which one of the following lists the method(s) used to add positive reactivity during a normal power increase from 10% to 100%?

A. Control rod withdrawal only

B. Recirculation pump flow increase only

C. Control rod withdrawal and recirculation pump flow increase

D. Recirculation pump flow increase and steaming rate increase

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.18 [3.8/3.8]
QID: B2070 (P2071)

Neglecting the effects of changes in core Xe-135, which one of the following power changes requires the <u>greatest</u> amount of positive reactivity addition?

A. 3% power to 5% power

B. 5% power to 15% power

C. 15% power to 30% power

D. 30% power to 60% power

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.18 [3.8/3.8]
QID: B2072 (P2069)

With a reactor on a constant period of 180 seconds, which one of the following power changes requires the longest amount of time to occur?

A. 3% power to 5% power

B. 5% power to 15% power

C. 15% power to 30% power

D. 30% power to 60% power

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.18 [3.8/3.8]
QID: B2166

A nuclear power plant is operating at 80% of rated power near the end of a fuel cycle. Which one of the following lists the typical method(s) used to add positive reactivity during a normal power increase to 100%?

A. Withdrawal of deep control rods and increasing recirculation flow rate

B. Withdrawal of deep control rods only

C. Withdrawal of shallow control rods and increasing recirculation flow rate

D. Withdrawal of shallow control rods only

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.18 [3.8/3.8]
QID: B2270

With a reactor on a constant period, which one of the following power changes requires the <u>shortest</u> time to occur?

A. 1% power to 4% power

B. 5% power to 15% power

C. 20% power to 35% power

D. 40% power to 60% power

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.18 [3.8/3.8]
QID: B2470

Neglecting the effects of core Xe-135, which one of the following power changes requires the greatest amount of positive reactivity addition?

A. 3% power to 10% power

B. 10% power to 25% power

C. 25% power to 60% power

D. 60% power to 100% power

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.18 [3.8/3.8]
QID: B2669 (P2169)

Neglecting the effects of core Xe-135, which one of the following power changes requires the smallest amount of positive reactivity addition?

A. 2% power to 5% power

B. 5% power to 15% power

C. 15% power to 30% power

D. 30% power to 50% power

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.18 [3.8/3.8]
QID: B2770 (P2770)

With a reactor on a constant period of 180 seconds, which one of the following power changes requires the shortest amount of time to occur?

A. 3% power to 5% power

B. 5% power to 15% power

C. 15% power to 30% power

D. 30% power to 60% power

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.18 [3.8/3.8]
QID: B3769 (P3753)

Neglecting the effects of changes in core Xe-135, which one of the following power changes requires the smallest amount of positive reactivity addition?

A. 3% power to 10% power

B. 10% power to 15% power

C. 15% power to 30% power

D. 30% power to 40% power

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.19 [3.1/3.2]
QID: B69

For which one of the following events will the Doppler coefficient act first to change the reactivity addition to the core?

A. A control rod drop during reactor power operation

B. The loss of one feedwater heater (extraction steam isolated) during reactor power operation

C. Tripping of the main turbine at 45% reactor power

D. A safety relief valve opening during reactor power operation

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.19 [3.1/3.2]
QID: B367

Reactor power was increased from 20% to 30% in 1 hour using only control rod withdrawal. Which one of the following describes the response of void fraction during the power increase?

A. Void fraction initially decreases, then increases back to the original value.

B. Void fraction initially increases, then decreases back to the original value.

C. Void fraction decreases and stabilizes below the original value.

D. Void fraction increases and stabilizes above the original value.

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.19 [3.1/3.2]
QID: B1169

Which one of the following describes the core void fraction response that accompanies a reactor power increase from 20% to 30% using only control rod withdrawal?

A. Decreases and stabilizes at a lower void fraction

B. Increases and stabilizes at a higher void fraction

C. Initially decreases, then increases and stabilizes at the initial void fraction

D. Initially increases, then decreases and stabilizes at the initial void fraction

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.19 [3.1/3.2]
QID: B1368

A nuclear power plant is operating at 90% of rated power late in core life. When an operator withdraws a shallow rod two notches a power <u>decrease</u> occurs. This power decrease can be attributed to rod worth being ____________ and ____________ bundle void content.

A. high; decreased

B. high; increased

C. low; increased

D. low; decreased

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.19 [3.1/3.2]
QID: B2670

A reactor is operating with the following initial conditions:

Power level = 100%
Control rod density = 60%

After a load decrease reactor conditions are as follows:

Power level = 80%
Control rod density = 62%

All parameters attained normal steady-state values before and after the power change.

Given the following:

Total control rod
reactivity change = $-2.2 \times 10^{-1}\% \Delta K/K$
Power coefficient = $-1.5 \times 10^{-2}\% \Delta K/K/\%$ power

How much reactivity was added by changes in core recirculation flow rate during the load decrease? (Assume fission product poison reactivity does not change.)

A. $0.0\% \Delta K/K$

B. $-5.2 \times 10^{-1}\% \Delta K/K$

C. $-2.0 \times 10^{-1}\% \Delta K/K$

D. $-8.0 \times 10^{-2}\% \Delta K/K$

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.19 [3.1/3.2]
QID: B2970 (N/A)

If a reactor power increase is accomplished using only the control rods, which one of the following would result in the greatest amount of negative reactivity feedback from the void coefficient?

A. A void fraction increase from 5% to 10% at beginning of core life

B. A void fraction increase from 5% to 10% at end of core life

C. A void fraction increase from 40% to 45% at beginning of core life

D. A void fraction increase from 40% to 45% at end of core life

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.20 [3.3/3.4]
QID: B70

A nuclear power plant is operating at 100% power and core flow rate. Reactor power is reduced to 90% by inserting control rods. (Recirculating pump speed remains constant.)

What is the effect on core flow rate?

A. Core flow rate will decrease due to an increase in core voiding.

B. Core flow rate will increase due to the decrease in recirculation ratio.

C. Core flow rate will increase due to the decrease in two-phase flow resistance.

D. Core flow rate will decrease due to an increase in two-phase flow resistance.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.20 [3.3/3.4]
QID: B183

A power increase is initiated by an increase in recirculation flow, causing voids to be swept away and adding positive reactivity. Which one of the following statements best describes the response of the reactivity coefficients?

A. Increasing fuel temperature implies more heat transfer to the coolant; increased moderator temperature causes more void formation, and power stabilizes at a new higher level.

B. Increasing fuel temperature implies more heat transfer to the coolant, thus increasing steam generation; the increased void fraction and fuel temperature add negative reactivity, and power stabilizes at a new higher level.

C. Increasing fuel temperature implies more heat transfer to the coolant, thus increasing steam generation; the increased steam generation raises reactor pressure and moderator temperature, offsetting the decreasing voids, and power stabilizes at a new higher level.

D. Increased moderator and fuel temperature stabilize power at a new higher level.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.20 [3.3/3.4]
QID: B1469

Reactor power is increased from 70% to 90% by changing recirculation flow. Which one of the following describes the effect on the plant?

A. Core void fraction increases.

B. Feedwater temperature decreases.

C. Reactor vessel outlet steam pressure increases.

D. Condensate depression in the main condenser hotwell increases.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.21 [2.9/3.0]
QID: B270

A nuclear power plant has been operating at full power for several months. Following a normal reactor shutdown, steam production will continue for a period of time, with the rate (Btu/hr) of steam production dependent upon the...

A. rate of reactor power decrease from full power to the point of adding heat.

B. pressure being maintained in the reactor pressure vessel (RPV).

C. previous power history of the plant and the time elapsed since shutdown.

D. recirculation flow rate and the water level being maintained in the RPV.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.21 [2.9/3.0]
QID: B1372 (P1272)

Following a reactor shutdown from three-months operation at full power, core heat production will continue for a period of time. The rate of core heat production will be dependent upon the...

A. amount of fuel that has been depleted.

B. amount of time that has elapsed since K_{eff} decreased below 1.0.

C. amount of time required for the reactor pressure vessel to cool down.

D. rate at which the photoneutron source strength decays following shutdown.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.21 [2.9/3.0]
QID: B3169 (P3171)

A nuclear power plant is operating at 60% of rated power in the middle of a fuel cycle when a turbine control system malfunction closes the turbine steam inlet valves an additional 5 percent. Which one of the following describes the <u>initial</u> reactor power change and the cause for the power change?

A. Decrease, because the rate of neutron absorption in the moderator initially increases.

B. Decrease, because the rate of neutron absorption at U-238 resonance energies initially increases.

C. Increase, because the rate of neutron absorption in the moderator initially decreases.

D. Increase, because the rate of neutron absorption at U-238 resonance energies initially decreases.

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.21 [2.9/3.0]
QID: B4036

A nuclear power plant is operating at 60% of rated power in the middle of a fuel cycle when a turbine control system malfunction opens the turbine steam inlet valves an additional 5 percent. Which one of the following describes the <u>initial</u> reactor power change and the cause for the power change?

A. Decrease, because the rate of neutron absorption in the moderator initially increases.

B. Decrease, because the rate of neutron absorption at U-238 resonance energies initially increases.

C. Increase, because the rate of neutron absorption in the moderator initially decreases.

D. Increase, because the rate of neutron absorption at U-238 resonance energies initially decreases.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.22 [3.5/3.6]
QID: B570

A nuclear power plant is operating normally at 50% of rated power when a steam line break occurs that releases 5% of rated steam flow. Assume no operator or protective actions occur, automatic pressure control returns reactor pressure to its value prior to the break, and feedwater injection temperature remains the same.

How will reactor power respond to the steam line break?

A. Decrease and stabilize at a lower power level

B. Increase and stabilize at a higher power level

C. Decrease initially, then increase and stabilize at the previous power level

D. Increase initially, then decrease and stabilize at the previous power level

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.22 [3.5/3.6]
QID: B971

A nuclear power plant is operating at 85% of rated power when a failure of the steam pressure control system opens the turbine control valves to admit 10% more steam flow to the main turbine. No operator actions occur and no protective system actuations occur.

How will reactor power respond? (Assume the control valves remain in the failed position.)

A. Increase until power level matches the new steam demand.

B. Increase continuously and exceed reactor protection set points.

C. Decrease and stabilize at a lower power level above the point of adding heat.

D. Decrease and stabilize at a critical power level below the point of adding heat.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.22 [3.5/3.6]
QID: B1670

A nuclear power plant is operating normally at 50% of rated power when a steam break occurs that releases 5% of rated steam flow. Assume no operator or protective actions occur, automatic pressure control returns reactor pressure to its initial value, and feed water injection temperature remains the same.

How will turbine power respond?

A. Decrease and stabilize at a lower power level.

B. Increase and stabilize at a higher power level.

C. Decrease, then increase and stabilize at the previous power level.

D. Increase, then decrease and stabilize at the previous power level.

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.22 [3.5/3.6]
QID: B2371

A nuclear power plant is operating at 90% of rated power at the end of core life when the turbine control system opens the turbine control valves an additional 5 percent. Reactor power will initially...

A. increase due to positive reactivity addition from the void coefficient only.

B. increase due to positive reactivity addition from the void and moderator temperature coefficients.

C. decrease due to negative reactivity addition from the void coefficient only.

D. decrease due to negative reactivity addition from the void and moderator temperature coefficients.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.22 [3.5/3.6]
QID: B2571

A nuclear power plant is operating normally at 50% of rated power when a steam break occurs that releases 5% of rated steam flow. Reactor power will initially...

A. increase due to positive reactivity addition from the void coefficient only.

B. increase due to positive reactivity addition from the void and moderator temperature coefficients.

C. decrease due to negative reactivity addition from the void coefficient only.

D. decrease due to negative reactivity addition from the void and moderator temperature coefficients.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.23 [2.6/3.1]
QID: B368

Which one of the following is the purpose of a rod sequence exchange?

A. Ensures proper rod coupling

B. Prevents rod shadowing

C. Promotes even fuel burnout

D. Minimizes water hole peaking

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.23 [2.6/3.1]
QID: B2572

During continuous reactor power operation, rod pattern exchanges are performed periodically to...

A. ensure some control rods remain inserted as deep control rods until late in the fuel cycle.

B. allow the local power range monitoring nuclear instruments to be asymmetrically installed in the core.

C. increase the rod worth of control rods that are nearly fully withdrawn.

D. prevent the development of individual control rods with very high reactivity worths.

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.25 [2.8/2.9]
QID: B72 (P71)

Shortly after a reactor trip, reactor power indicates 5 x 10^{-2}% when a stable negative reactor period is attained. Approximately how much additional time is required for reactor power to decrease to 5 x 10^{-3}%?

A. 90 seconds

B. 180 seconds

C. 270 seconds

D. 360 seconds

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.25 [2.8/2.9]
QID: B771 (P770)

Which one of the following is responsible for the negative 80-second stable reactor period experienced shortly after a reactor scram?

A. The shortest-lived delayed neutron precursors

B. The longest-lived delayed neutron precursors

C. The shutdown margin just prior to the scram

D. The worth of the inserted control rods

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.25 [2.8/2.9]
QID: B1369 (P1965)

Shortly after a reactor scram, reactor power indicates 10^{-3}% where a stable negative period is attained. Reactor power will decrease to 10^{-4}% in approximately ______________ seconds.

A. 380

B. 280

C. 180

D. 80

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.25 [2.8/2.9]
QID: B1770 (P2171)

Following a reactor trip, reactor power indicates 0.1% when the typical stable post-trip reactor period is observed. Which one of the following is the approximate time required for reactor power to decrease to 0.05%?

A. 24 seconds

B. 55 seconds

C. 173 seconds

D. 240 seconds

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.25 [2.8/2.9]
QID: B2071

A nuclear power plant is operating at 100% power at the end of core life when a single main steam isolation valve suddenly closes. Prior to a reactor scram, reactor power will initially...

A. increase due to positive reactivity addition from the void coefficient only.

B. increase due to positive reactivity addition from the void and moderator coefficients.

C. decrease due to negative reactivity addition from the Doppler coefficient only.

D. decrease due to negative reactivity addition from the Doppler and moderator temperature coefficients.

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.25 [2.8/2.9]
QID: B2769 (P2768)

Reactors A and B are identical and have been operated at 100% power for six months when a reactor scram occurs simultaneously on both reactors. All reactor A control rods fully insert. One reactor B control rod sticks fully withdrawn.

Which reactor, if any, will have the longest reactor period five minutes after the scram?

A. Reactor A due to the greater shutdown reactivity.

B. Reactor B due to the smaller shutdown reactivity.

C. Both reactors will have the same reactor period because, after five minutes, both reactors will be stable at a power level low in the source range.

D. Both reactors will have the same reactor period because, after five minutes, only the longest-lived delayed neutron precursors will be releasing fission neutrons.

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.25 [2.8/2.9]
QID: B3271 (P3271)

Nuclear reactors A and B are identical and have been operated at 100% power for six months when a reactor scram occurs simultaneously on both reactors. All reactor A control rods fully insert. One reactor B control rod sticks fully withdrawn.

After five minutes, when compared to reactor B, the core fission rate in reactor A will be _____________, and the reactor period in reactor A will be ______________.

A. the same; shorter

B. the same; the same

C. lower; shorter

D. lower; the same

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.25 [2.8/2.9]
QID: B3472 (P3468)

A reactor is critical just below the point of adding heat when an inadvertent reactor scram occurs. All control rods fully insert except for one rod, which remains fully withdrawn. Five minutes after the reactor scram, with reactor period stable at approximately negative (-) 80 seconds, the remaining withdrawn control rod suddenly and rapidly fully inserts.

Which one of the following describes the reactor response to the insertion of the last control rod?

A. The negative period will remain stable at approximately -80 seconds.

B. The negative period will immediately become shorter, and then lengthen and stabilize at approximately -80 seconds.

C. The negative period will immediately become shorter, and then lengthen and stabilize at a value more negative than -80 seconds.

D. The negative period will immediately become shorter, and then lengthen and stabilize at a value less negative than -80 seconds.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.25 [2.8/2.9]
QID: B3771 (P3772)

A nuclear plower plant that has been operating at rated power for two months experiences a reactor scram. Five minutes after the scram, with all control rods still fully inserted, a count rate of 5,000 cps is indicated on the source range nuclear instruments with a reactor period of negative 80 seconds.

The majority of the source range detector output is currently being caused by the interaction of ____________ with the detector.

A. intrinsic source neutrons

B. fission gammas from previous power operation

C. fission neutrons from subcritical multiplication

D. delayed fission neutrons from previous power operation

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.26 [3.4/3.7]
QID: B471

A nuclear power plant is operating at 100% power when one recirculation pump trips. Reactor power decreases and stabilizes at a lower power level. Which one of the following reactivity coefficients caused the initial decrease in reactor power?

A. Void

B. Pressure

C. Moderator temperature

D. Fuel temperature (Doppler)

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.26 [3.4/3.7]
QID: B672

A nuclear power plant is operating at 70% of rated power when one recirculation pump trips. Reactor power will initially __________ because of the effects of the __________ coefficient.

A. decrease; void

B. increase; moderator temperature

C. decrease; moderator temperature

D. increase; void

ANSWER: A.

TOPIC: 292008
KNOWLEDGE: K1.27 [3.4/3.5]
QID: B126

A reactor is exactly critical in the source range when a fully withdrawn control rod fully inserts into the core.

If no operator or automatic actions occur, how will the source range count rate respond?

A. Decrease to zero.

B. Decrease to the value of the source neutron strength.

C. Decrease to a value above the source neutron strength.

D. Decrease initially and then slowly increase and stabilize at the initial value.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.27 [3.4/3.5]
QID: B1472 (N/A)

A nuclear power plant is initially operating at 100% power when a control rod fully inserts into the core. Assuming no operator action, reactor power will initially decrease and then...

A. return to the original power level with the void boundary lower in the core.

B. stabilize at a lower power level with the void boundary lower in the core.

C. return to the original power level with the void boundary higher in the core.

D. stabilize at a lower power level with the void boundary higher in the core.

ANSWER: D.

TOPIC: 292008
KNOWLEDGE: K1.27 [3.4/3.5]
QID: B1969 (P672)

A reactor is exactly critical below the point of adding heat when a single control rod is fully inserted into the core. Assuming no operator or automatic action, reactor power will slowly decrease to...

A. zero.

B. an equilibrium value less than the source neutron strength.

C. an equilibrium value greater than the source neutron strength.

D. a slightly lower value, then slowly return to the initial value.

ANSWER: C.

TOPIC: 292008
KNOWLEDGE: K1.30 [3.2/3.5]
QID: B131 (P2672)

Which one of the following percentages most closely approximates the decay heat produced in the reactor at 1 second and at 1 hour, respectively, following a scram from extended operation at 100% power?

	ONE SECOND	ONE HOUR
A.	15.0%	1.0%
B.	7.0%	1.0%
C.	1.0%	0.1%
D.	0.5%	0.1%

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.30 [3.2/3.5]
QID: B372 (P370)

After one month of operation at 100% reactor power, the fraction of thermal power being produced from the decay of fission products in the operating reactor is:

A. greater than 10%.

B. greater than 5% but less than 10%.

C. greater than 1% but less than 5%.

D. less than 1%.

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.30 [3.2/3.5]
QID: B2272 (P572)

A nuclear power plant has been operating at 100% power for several weeks when a reactor scram occurs. How much time will be required for core heat production to decrease to 1% following the scram?

A. 1 to 8 days

B. 1 to 8 hours

C. 1 to 8 minutes

D. 1 to 8 seconds

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.30 [3.2/3.5]
QID: B2872 (P2872)

A reactor has been shutdown for several weeks when a loss of all ac power results in a loss of forced decay heat removal flow.

Given the following information, what will be the average reactor coolant heatup rate during the 20 minutes immediately after decay heat removal flow is lost? Assume that only ambient losses are removing heat from the reactor coolant system (RCS).

Reactor rated thermal power:	2,800 MWt
Decay heat rate:	0.2% rated thermal power
RCS ambient heat loss rate:	2.4 MWt
RCS c_p:	1.1 Btu/lbm-°F
Reactor vessel coolant inventory:	325,000 lbm

A. Less than 25°F/hour

B. 26 to 50°F/hour

C. 51 to 75°F/hour

D. More than 76°F/hour

ANSWER: B.

TOPIC: 292008
KNOWLEDGE: K1.30 [3.2/3.5]
QID: B2972 (P2972)

A nuclear power plant has been operating for one hour at 50% of rated power following six months of operation at steady-state 100% power. Which one of the following is the percentage of rated thermal power currently being generated by decay heat?

A. 1% to 2%

B. 3% to 5%

C. 6% to 8%

D. 9% to 11%

ANSWER: B.